



Fast track

Are surgeons aware of the dangers of diathermy?

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Surgical diathermy is an invaluable aid in modern surgery and most contemporary diathermy machines are considered safe. However, diathermy accidents still do occur and a diathermy unit can be potentially lethal if adequate care is not exercised in its use.

The aim of this study was to evaluate the awareness of the safe and appropriate use of diathermy in surgery amongst different grades of surgeons. This article also attempts to provide an insight into the basic understanding of surgical diathermy.

Materials and Methods

This study was conducted at a district general hospital in Wales and included 30 doctors from various specialties including general surgery, trauma and orthopaedics, obstetrics and gynaecology, ENT, and urology. They comprised ten consultants, ten middle-grades and ten SHO's.

Each participant was interviewed with the help of a questionnaire which covered various aspects of safety and basic technical knowledge of surgical diathermy. Data were collected on various aspects of surgical diathermy including the background knowledge of high frequency electrosurgery and its potential hazards. The choice of the diathermy type (monopolar or bipolar) and justification for its use were noted. Details of personal

experiences with diathermy injuries to themselves and to patients were recorded. The participants in this study were also asked whether they felt there was a need for further education on diathermy. The responses thus obtained were then analysed in detail.

Results

Of the 30 doctors interviewed, 12 used only monopolar diathermy during surgery. However, a significant number (ten out of 30) employed both monopolar and bipolar diathermy; eight surgeons utilised bipolar diathermy only.

When asked about the reason for preference, the responses were very varied and interesting: 'less tissue damage with bipolar diathermy' (eight participants); 'easier and quicker with monopolar diathermy' (eight); 'the choice depends on the procedure' (four); and 'unsure' (ten). Of those surgeons who used monopolar diathermy, 12 used coagulation mode only, ten used a combination of coagulation and cutting mode, five used a blended cutting mode and three were not aware of the

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mode that they used. Interestingly, five doctors of the 30 interviewed, did not know the correct relationship between the pedal or button colour and the diathermy mode.

A majority of the participants (18) did not routinely supervise the application of the neutral plate on to the patient and 14 of those interviewed were not aware of the typical voltage difference between the active and the neutral electrode. Yet, 28 surgeons felt that the modern diathermy machines were safe.

Seven respondents had personal experience of patients sustaining diathermy burns. Of these, five blamed themselves for the accidents, whereas two surgeons felt that the diathermy machine was faulty. Fourteen doctors said that they would merely increase the diathermy setting if they were unhappy about the diathermy effect during an operation, without paying attention to potential faults in the circuit.

Discussion

The first surgical diathermy machine was designed by W.T. Bovie in 1928 to facilitate tumour removal and haemostasis in neurosurgery.¹ The underlying principle of high frequency electrosurgery involves the passage of electrical current through the body, to deliberately burn the tissue at the active electrode tip where the current concentration is the highest. Current electricity is a stream of electrons flowing through a conductor. In order for a current to exist in any conductor, there must be an electromotive force, or voltage, between the conductor's ends. A surgical diathermy generates an alternating voltage across its terminals so that current passes through the leads and the patient. The current excites tissue molecules, producing heat. For cutting, intracellular water boils, cells explode and tissue divides. At lower temperatures, the heat causes cell drying and blood protein is coagulated, causing haemostasis.

A diathermy machine converts electricity from the mains supply (240 V, 50 Hz) into high frequency current at radio wave frequencies,² thus minimising the risk of electrical shocks. Often the voltage across the patient is greater than the mains supply. There are two diathermy modes, monopolar and bipolar.

In monopolar, the current from the diathermy enters the patient through the small area active electrode and exits safely through the large area neutral electrode. In our study, a significant number of surgeons did not personally supervise the application of patient neutral plate, which could lead to diathermy injuries.

The hazards of monopolar electrosurgery include unintended high frequency current burns to the patient and/or staff by sparking to unwanted areas.³ The main advantage of monopolar diathermy is ease of use and

greater effectivity.⁴ In our study, monopolar diathermy was the most popular modality.

Bipolar diathermy is undoubtedly safer than monopolar diathermy as the current passes between the two prongs of the electrode without any significant flow through the patient. A neutral electrode is not required. The significant advantage of bipolar diathermy is the reduction of tissue damage.⁵ Several studies have reported satisfactory haemostasis with less tissue injury than monopolar techniques.^{6,7}

In laparoscopic surgery, direct and capacitive coupling of diathermy current have been reported as causes of occult injury and plastic cannulae afford no greater protection from skin burns than metal cannulae.⁸ Capacitive coupling may be prevented by avoiding hybrid ports.

Conclusions

This study demonstrated significant levels of ignorance, regardless of the seniority or specialty, about a potentially dangerous, yet routinely used, piece of operating theatre equipment. These findings are a matter of grave concern. In these days of clinical effectiveness, clinical governance and increasing medicolegal consciousness, the authors strongly feel that refresher courses on surgical diathermy should be held regularly as a part of continuing medical education, targeting both junior level trainees as well as more senior colleagues.

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